STSM Scientific Report

COST action: MP1304 (NewCompStar), 2nd STSM call 2015
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STSM topic: Extended theories of gravity and observations
Host: Salvatore Capozziello

During my visit, from 8th June 2015 to 15th June 2015, I had a close collaboration with Dr. Capozziello, professor at the Department of Physics, University of Naples "Federico II", Naples, Italy. My research group from Serbia, together with Italian group led by Dr. Capozziello, leading expert in field of extended theories of gravity, further developed collaboration which was recently started thanks to the STSM Grant awarded in April 2015.

As we had opportunity to work on our research project "Extended theories of gravity and observations", my contribution to NewCompStar COST action was working on the models of extended theories of gravity, as well as comparing the obtained results with the existing astronomical observations. We used the data, e.g. properties, of the stellar systems which are the result of the collected efforts of many astronomers over the years. Our basic motivation was to recover fundamental plane (FP) of elliptical galaxies using modified R^n gravity, the power-law version of $f(R)$ modified gravity, completely avoiding the issues related to dark matter. Recovering FP means to find connection between parameters in fundamental plane equation and parameters of R^n gravity potential. Our main result is the connection between r_c (scalelength of R^n gravity depending on the gravitating system properties) and r_e (effective radius).

Considering the definition of r_e, we are saying that the effective radius (defined photometrically as the radius containing half of the luminosity of a galaxy) is led by gravity. We can conclude that it means that we have no need for dark matter at all since gravitational corrections lead photometry. Also, by recovering the fundamental plane from modified gravity potential, and without using dark matter, the success of extended theories of gravity is pointed out. The obtained results are important for further investigation of the gravitation physics of neutron stars.

Some of these results are presented at the conference 10th Serbian Conference on Spectral Line Shapes in Astrophysics, Srebrno jezero, Serbia, June 15-19, 2015, in the frame of the special session "Spectral Lines and Compact Stars", dedicated to the COST Action MP1304. Besides, during this STSM we worked on revision for the paper submitted to JCAP (D. Borka, S. Capozziello, P. Jovanović, V. Borka Jovanović, *Probing hybrid modified gravity by stellar motion around Galactic Centre,* arXiv:1504.07832 [gr-qc]) where NewCompStar will be added in the Acknowledgments.

Борка Јовановић Весна

25. 06. 2015. Vesna Borka Jovanović